

ENDANGERED SPECIES

Technical Bulletin

Department of the Interior, U.S. Fish and Wildlife Service, Washington, D.C. 20240

California Condor Population Grows by One

The first California condor (*Gymnogyps californianus*) chick ever conceived in captivity hatched in an incubation chamber at San Diego Wild Animal Park on April 29, marking a turning point in efforts to save the critically endangered species. This event brings the cooperative recovery program one step closer to the day when California condors can be released back into their native habitat.

The chick, which was given the name "Molloko" (a Maidu Indian word for condor), hatched after a 57-day incubation at the zoological park. Veterinarians said the chick's condition was good and it appeared strong. Attendants helped the chick emerge from the shell and removed the last fragments 61½ hours after it first started to hatch. Four days later, zookeepers introduced the chick to its surrogate parent, a hand puppet designed to look like the head of an adult condor. Using the puppet, keepers feed the chick minced mice and regurgitated vulture food. When the chick is about one month old, it will be transferred to outdoor facilities where the other condors are housed. At that time, veterinarians will decide whether or not it is an appropriate time for blood tests to determine its sex.

After the egg was laid on March 3, it was removed from the cage housing its parents in order to stimulate them to produce another egg. Although the pair resumed mating activities the next day, no additional eggs have been produced. Biologists are hoping for greater success next year. California condors in the wild have shown the ability to produce up to three eggs in a season to replace ones that are lost.

Four of the last five known California condor breeding pairs in the wild disappeared over the winter of 1984–1985. The Fish and Wildlife Service then decided that bringing the few remaining birds into a captive breeding program, thereby increasing their numbers, was the best chance to avert the species' extinction while investigations continue into the mortality of condors in the wild. The last free-flying condor was captured on the Bitter Creek National Wildlife Refuge in 1987. In addition to the new chick, there are now 27 California condors in



California condor chick Molloko receives a meal of minced mice from its "puppet parent" at San Diego Wild Animal Park.

existence; 14 are housed in breeding facilities at the San Diego Wild Animal Park and 13 are similarly cared for at the

Los Angeles Zoo. The combined population is composed of 13 males and 14 females.

photo by Craig W. Racioc, courtesy of Zoological Society of San Diego



Regional endangered species biologists have reported the following recent news and activities:

Region 1 - An Environmental Assessment evaluating a temporary, experimen-

tal release of same-sex, captive-bred Andean condors (*Vultur gryphus*) in the southern California range of the California condor (*Gymnogyps californianus*) was distributed recently to 260 State, Federal, and private reviewers for a 30-day com-

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U.S. Fish and Wildlife Service Regions

Region 1: California, Hawaii, Idaho, Nevada, Oregon, Washington, American Samoa, Commonwealth of the Northern Mariana Islands, Guam, and the Pacific Trust Territories. **Region 2:** Arizona, New Mexico, Oklahoma, and Texas. **Region 3:** Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, and Wisconsin. **Region 4:** Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Puerto Rico, and the U.S. Virgin Islands. **Region 5:** Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia, and West Virginia. **Region 6:** Colorado, Kansas, Montana, Nebraska, North Dakota, South Dakota, Utah, and Wyoming. **Region 7:** Alaska. **Region 8:** Research and Development nationwide.

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ment period. The proposed research task is designed to test release techniques, evaluate and select suitable release sites, and train personnel. Released birds will be equipped with radio tags to allow tracking and gathering of behavioral data. The information gained will be used when captive-bred California condors are eventually released to the wild.

Regional staff members attended the annual Desert Tortoise Council meetings in Laughlin, Nevada, March 26-29, 1988. The major issues of interest covered at the meeting included conservation biology theory applied to the desert tortoise (*Xerobates agassizii*), the Bureau of Land Management's (BLM) new plan to manage the tortoise's habitat on BLM lands, some specific planned projects that will have a significant impact on the tortoise, discussion on the genetic and morphometric differences of the three apparently distinct populations, and status reports.

Senior Staff Biologist John Ford of the Honolulu, Hawaii, Field Office was nominated by Hawaii Governor John Waihee to a 4-year term as a member of the Natural Area Reserves System Commission. State Senate confirmation is expected shortly.

Region 2 - CBS Evening News gave coverage to the avian cholera outbreak among waterfowl in the San Luis Valley, Colorado, in February and the possible threat to whooping cranes (*Grus americana*). An estimated 6,000 ducks and geese died. Over 20 sandhill crane (*Grus canadensis*) carcasses were recovered but no whooping cranes were known to be affected. Knowledge of the problem in the San Luis Valley allowed Bosque del Apache National Wildlife Refuge in New Mexico to provide supplemental grain to whooping cranes, holding them in New Mexico for about 2 weeks longer than normal. The disease outbreak was over in late March when mild weather allowed the birds to disperse to many roost sites and made food more accessible.

The Canadian Whooping Crane Recovery Plan was published recently by the Canadian Wildlife Service. This plan complements the U.S. recovery plan and emphasizes actions within the boundaries of Canada. The Canadian Whooping Crane Recovery Team is the first recovery team organized in Canada and the plan is the first prepared for recovery of an endangered species in Canada. Copies are available from Dr. James Lewis, Whooping Crane Coordinator, U.S. Fish and Wildlife Service, P.O. Box 1306, Albuquerque, New Mexico 87103.

Seventy-six seedlings of Kearney's blue-star (*Amsonia kearneyana*) were planted on a private ranch in a remote canyon of the Baboquivari Mountains

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Endangered Species Act Protection is Proposed for Nine Species

During April 1988, three species of plants and six species of invertebrate animals were proposed by the Fish and Wildlife Service for Federal listing as Endangered or Threatened. If the proposals are made final, Endangered Species Act protection will be extended to the following:

Alabama Canebroke Pitcher-plant (*Sarracenia rubra* ssp. *alabamensis*)

Some of the rarest and most unusual plants of the southeast are the pitcher plants, carnivorous species that trap and digest insects within hollow leaves or "pitchers." These plants grow only in open, boggy sites, a limited type of habitat that is rapidly being modified for agriculture and other purposes. Threats to pitcher plants also come from collectors, who are attracted to these species by their scarcity and distinctive feeding habits. As a result, the Service has taken action to give the most vulnerable taxa protection under the Endangered Species Act. The green pitcher plant (*Sarracenia oreophila*) is listed as Endangered, and the same status recently was proposed for the mountain sweet pitcher plant (*Sarracenia rubra* ssp. *jonesii*). (See story in BULLETIN Vol. XIII No. 3.) Now, the Service has proposed to list a related taxon, the Alabama canebroke pitcher plant (*Sarracenia rubra* ssp. *alabamensis*) as Endangered (F.R. 4/21/88).

The Alabama canebroke pitcher-plant occurs in sandhill seeps, swamps, and bogs along the fall-line of central Alabama. It requires sunny areas with little competition from woody vegetation. Historically, this subspecies was reported from 27 sites, but 16 of them have been destroyed through habitat alteration (e.g., drainage and conversion to cropland or pasture), herbicide application, overcollecting, and/or vegetational succession (due to suppression of naturally-occurring wildfires).

Extensive searches of potential habitat over the past 20 years indicate that only 11 populations remain—5 in Chilton County, 4 in Autauga County, and 2 in Elmore County. All are on private lands. Only 3 of the remaining 11 populations are of significant size (50 or more plants). Two of these three sites face imminent threats, one from gravel mining and the other from drainage.

Taking is another well-documented threat to the Alabama canebroke pitcher plant. Collecting by commercial plant dealers and hobbyists has contributed to the destruction of several historical populations and significantly depleted many others. In 1975, one collector even ran an advertisement in a local newspaper offer-



Alabama canebroke pitcher-plant (*Sarracenia rubra* var. *alabamensis*)

ing a reward for pitcher plant locations and specimens. Listing *S. r.* ssp. *alabamensis* as Endangered would not prohibit taking of this plant on State or private lands, but it would restrict interstate trade.

Major landowners have been contacted about the presence of the Alabama canebroke pitcher plant on their property and informed about land uses compatible with its survival. Several owners have been very receptive to protection, and efforts are under way to enlist the support of others. Suggested habitat management techniques include the use of prescribed burning or manual clearing in order to maintain the open sites needed by the pitcher plant.

Comments on the proposal to list the Alabama canebroke pitcher plant as Endangered are welcome and should be sent to the Jackson Field Office, U.S. Fish and Wildlife Service, Jackson Mall Office Center, Suite 316, 300 Woodrow Wilson Avenue, Jackson, Mississippi 39213, by June 20, 1988.

Cooley's Meadowrue (*Thalictrum cooleyi*)

As its common name indicates, Cooley's meadowrue is a plant found in open sites.

This small herb in the buttercup family (Ranunculaceae) is endemic to a few areas of the southeastern coastal plain, where it inhabits wet savannas, bogs, and other sunny, moist locations. Habitat modification and the direct application of herbicides threaten this plant's survival, and the Service has proposed to list it as an Endangered species (F.R. 4/21/88).

T. cooleyi is a rhizomatous perennial with narrow, lance-shaped leaves. Its stems, which seldom reach more than 40 inches (one meter) in height, are erect in the full sun but sometime sprawling when in shade. A dioecious species, Cooley's meadowrue bears separate male and female flowers. Both types of flowers are very small and lack petals, but the staminate (male) blossoms have yellowish to white sepals with lavender filaments and the pistillate (female) ones have greenish sepals. The dioecious nature of *T. cooleyi* further increases the vulnerability of very small populations in which plants of only one sex may remain.

Historically, 15 populations of Cooley's meadowrue were reported from 7 counties in North Carolina, Georgia, and Florida. Only 10 are known to survive, one in Florida (Walton County) and the rest in North Carolina (Columbus, Onslow, and Pender Counties). All 10 are on privately owned land, although The Nature Conservancy owns part of one site in Pender County. The extirpated populations are believed to have succumbed as a result of fire suppression and silvicultural/agricultural activities. These and other threats, such as mining, drainage, road construction, and herbicide use, pose danger to the remaining populations.

Because *T. cooleyi* is shade-intolerant, it depends on wildfires or certain other kinds of disturbance to maintain the open, sunny areas upon which the species depends. It is no accident that seven of the current populations are along roadsides or in powerline rights-of-way. Fire suppression has allowed shrubs and trees to encroach on some *T. cooleyi* sites, making the habitat too shady for this species. As a substitute for fire, certain other kinds of disturbance, such as mowing and logging, can open up habitat for the meadowrue if properly done; however *T. cooleyi* cannot survive bulldozing, drainage, conversion of habitat to pine plantations, or the direct application of herbicides.

North Carolina already lists Cooley's meadowrue under State law as endangered, a classification that prohibits take without landowner permission and interstate trade without a permit. A Federal listing would complement this protection

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Nine Species

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and further encourage conservation of the species.

Comments on the Service's proposal to list Cooley's Meadowrue as a Threatened species are welcome and should be sent to the Asheville Field Office, U.S. Fish and Wildlife Service, 100 Otis Street, Room 224, Asheville, North Carolina, by June 20, 1988.

Dwarf-flowered Heartleaf (*Hexastylis naniflora*)

A herbaceous plant in the birthwort family (Aristolochiaceae), *H. naniflora* is known from only 24 populations in an 8-county area of the upper piedmont of North Carolina and adjacent South Carolina. The dark green, leathery, heart-shaped leaves are supported by long thin petioles arising from a subsurface rhizome. Its maximum height rarely exceeds 6 inches (15 centimeters). The usually beige to dark brown jug-shaped flowers, which appear from mid-March to early June, are small and inconspicuous. The dwarf-flowered heartleaf differs from other members of the genus *Hexastylis* by its small flowers and its habitat in acidic soils along bluffs and adjacent slopes, in boggy areas next to streams and creekheads, and along the slopes of nearby hillsides and ravines.

Three of the 24 populations currently receive some form of protection. Most of the largest South Carolina population, which contained over 4,000 plants until 64 percent were destroyed by construction of a reservoir, is now being protected by the City of Spartanburg. Two of the larger North Carolina populations are registered natural areas receiving short-term protection under that State's Natural Heritage Program. However, since these registry agreements are nonbinding, both sites remain vulnerable in the long term. The remaining populations of dwarf-flowered heartleaf are threatened by alteration or loss of habitat from conversion to pasture, grazing, intensive timber harvesting, residential construction, and construction of small ponds at former creekheads.

A natural factor affecting the vigor of some populations is the fact that their preferred habitat is often shared by dense stands of mountain laurel (*Kalmia latiflora*) or *Rhododendron* spp., which reduce the amount of light reaching the low-growing *H. naniflora*. In such situations, selective logging could benefit these heartleaf populations by opening them up to more light, provided that increased siltation from the intensive soil disturbances associated with forest clear-cutting is avoided.

In North Carolina, *H. naniflora* is listed under State law as endangered. Such plants are protected from intrastate trade without a permit, and the State statute also provides for monitoring and management. South Carolina currently offers no



photo by Robert R. Currie

dwarf-flowered heartleaf (*Hexastylis naniflora*)

official protection, although the dwarf-flowered heartleaf is unofficially recognized as an endangered component of the State's flora. The Service's April 21, 1988 proposal to list *H. naniflora* at the Federal level as a Threatened species, if finalized, will provide for additional protection and recovery activities.

Comments on this listing proposal are welcome, and should be sent to the Asheville Field Office by June 20, 1988.

Little-wing Pearlymussel (*Pegias fabula*)

The little-wing pearlymussel, the sole member of its genus, is a small freshwater mollusk whose size does not exceed 1.5 inches (3.8 cm) in length and 0.5 inch (1.3 cm) in width. The shell's outer surface is often eroded, giving it a chalky or ashy white appearance. Like other freshwater mussels, this species feeds by filtering food particles from the water. Its reproductive cycle includes an early larval stage when the mussel larvae (glochidia) probably attach to the gills or fins of a fish and transform into juvenile mussels. The young mussels then drop off to the stream substrate where, if conditions are favorable, they grow to maturity. The specific host fish for *P. fabula* and many other aspects of this mussel's life history are unknown.

Pegias fabula inhabits clear, cool, free-flowing streams and is usually found in the transitional zone between riffles and pools. The species has been recorded historically from 27 stream reaches in Alabama, North Carolina, Kentucky, Tennessee, and Virginia, all of them within the Tennessee and Cumberland River drainages. Based on extensive surveys of historical and potential habitat, however, it has been reduced in range to only six

short reaches—three in southeastern Kentucky, two in southwestern Virginia, and one in central Tennessee. On April 21, 1988, the Service proposed listing *P. fabula* as an Endangered species.

Habitat loss and water quality deterioration are the primary reasons for the sharp decline of the little-wing pearlymussel. Some sites were flooded by impoundments. Others were degraded by industrial and municipal pollution, siltation from certain mining or agricultural practices, or other land disturbances within the drainage. Most of these factors threaten the remaining six *P. fabula* populations. The Service has no evidence that further mining, if conducted in accordance with Federal and State regulations, is a threat to the mussel. Unregulated mining operations in the past, however, did contribute to the decline, and current activities not in compliance with appropriate regulations may be a threat.

Comments on the listing proposal are welcome, and should be sent to the Asheville Field Office by June 20, 1988.

Five Texas Cave Invertebrates

Five species of small, cave-dwelling invertebrate animals in Texas are believed to be vulnerable to extinction due to the projected impacts of development on their limited habitat. Each is restricted to six or fewer small, shallow, dry caves near the city of Austin. To help prevent the loss of these species, the Service has proposed listing the following as Endangered (F.R. 4.19.88):

- **Tooth Cave pseudoscorpion (*Microcreagris texana*)** — Resembling a tiny, tailless scorpion, this species reaches a maximum length of only 4 millimeters

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(approximately $\frac{3}{16}$ inch). It lacks both eyes and a stinger, and is harmless to humans, though it uses its pincers to prey on small insects and other arthropods. The only known sites for this animal are Tooth and Amber Caves, both in Travis County.

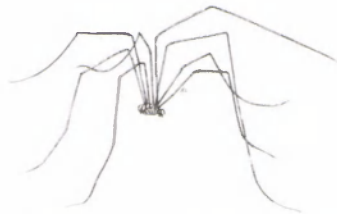
• **Tooth Cave spider (*Leptoneta myopica*)** — An even smaller creature, the Tooth Cave spider is 1.6 mm (about $\frac{1}{16}$ inch) in body length. This spider is sedentary, spinning webs from the ceiling and walls of Tooth Cave, its only habitat. Although it is never found outside the cave, it does have rudimentary eyes.

• **Bee Creek Cave harvestman (*Texella reddeni*)** — This light yellowish-brown harvestman has relatively long legs that extend from a small body (2 mm, or less than $\frac{1}{8}$ inch, in length). It is eyeless and probably predatory on small insects. *T. reddeni* is known from Tooth, Bee Creek, McDonald, Weldon, and Bone Caves in Travis and Williamson Counties.

• **Tooth Cave ground beetle (*Rhadine persephone*)** — Only marginally larger than the other invertebrates in the listing proposal, this species has a reddish-brown body 7-8 mm (about $\frac{5}{16}$ inch) long. Like the spider above, the Tooth Cave ground beetle has rudimentary eyes. It probably feeds on the eggs of cave crickets. *R. persephone* is known only from Tooth and Kretschmarr Caves in Travis County.

• **Kretschmarr Cave mold beetle (*Texamaurops reddeni*)** — This eyeless, dark-colored beetle with elongated legs measures less than 3 mm (approximately $\frac{1}{8}$ inch) in length. It is known from Kretschmarr, Tooth, Amber, and Coffin Caves in Travis and Williamson Counties.

The caves inhabited by all five of these invertebrates are small. McDonald Cave, the largest, consists of less than 60 meters (about 200 feet) of passage, and most of the others are considerably smaller. They occur as "islands" of cave habitat within the Edwards Limestone formation. Their isolation has resulted in the evolution of highly localized and distinct cave faunas. In addition to the five spe-



Harvestmen, sometimes referred to as "daddy longlegs," have a small, roundish body and eight long, thin legs.

cies proposed for listing, these caves and others in the area support a number of other uncommon and scientifically significant species.

The proximity of the caves to the city of Austin makes them vulnerable to the continued expansion of the metropolitan area. The main threat to the five cave invertebrates is the potential loss or degradation of their habitat from anticipated road construction, residential and commercial development, and industrial projects. Without proper safeguards, such activities could fill or collapse the shallow caves; alter drainage patterns that affect cave habitat; introduce exotic competitive and predatory organisms (e.g., cockroaches, sowbugs); and pollute the cave systems with pesticides, fertilizers, oils, and other harmful runoff. Development may already have claimed at least one site; Coffin Cave was not even found during recent survey attempts.

Comments on the listing proposal are welcome and should be sent to the Regional Director, Region 2 (address on BULLETIN page 2), by June 20, 1988.



Pseudoscorpions are tiny, harmless arachnids that somewhat resemble the larger true scorpions but lack the elongate tail, poison bulb, and stinger.

Conservation Measures Authorized by the Endangered Species Act

Among the conservation benefits provided to a species if its listing under the Endangered Species Act is approved are: protection from adverse effects of Federal activities; restrictions on take and trafficking; the requirement for the Service to develop and implement recovery plans; the authorization to seek land purchases or exchanges for important habitat; and the possibility of Federal aid to State or Commonwealth conservation departments that have signed Endangered Species Cooperative Agreements with the Service. Listing also lends greater recognition to a species' precarious status, which encourages further conservation efforts by State and local agencies, independent organizations, and individuals.

Section 7 of the Act directs Federal agencies to use their legal authorities to further the purposes of the Act by carrying out conservation programs for listed species. It also requires these agencies to ensure that any actions they authorize, fund, or carry out are not likely to jeopardize the survival of a listed species. If an agency finds that one of its activities may affect a listed species, it is required to consult with the Service on ways to avoid jeopardy. For species that are proposed for listing and for which jeopardy is found, Federal agencies are required to "confer" with the Service, although the results of such a conference are non-binding.

Further protection is authorized by Section 9 of the Act, which makes it illegal to take, possess, transport, or engage in interstate or international trafficking in listed animals except by permit for certain conservation purposes. For plants, the rule on take is different; the prohibition against collecting applies only to listed plants found on lands under Federal jurisdiction. Some States, however, have their own more restrictive laws against take of listed plants.

Listings Approved for Three Plants

Final listing rules were published recently for three species of plants, bringing Endangered Species Act protection to the following:

• **Relict trillium (*Trillium reliquum*)** — This herbaceous member of the lily family produces early spring flowers that are usually greenish to brownish-purple. Only 10 populations are known to exist—2 in Alabama, 3 in South Carolina, and 5 in Georgia. Habitat disturbance resulting from logging, urbanization and other development, and fire is the main threat to the relict trillium's survival. It was proposed in the January 14, 1987, *Federal Register* for listing as an Endangered species (see story in BULLETIN Vol. XII

No. 2), and the final rule was published April 4, 1988.

• **Palo de Nigua (*Cornutia obovata*)** — An evergreen tree endemic to Puerto Rico, *C. obovata* declined with the widespread deforestation of the island. Only seven individuals of this species currently are known to survive at two widely separated sites. Any further losses could lead to its extinction. The Service proposed on April 24, 1987, to list *C. obovata* as Endangered (see BULLETIN Vol. XII No. 5), and the final rule was published April 7, 1988.

• **White-haired goldenrod (*Solidago albopilosa*)** — This herbaceous perennial is known only from the Red River Gorge area of Daniel Boone National Forest in

eastern Kentucky. It is usually found in rockhouses (natural, shallow, cave-like formations) and beneath overhanging ledges. Because these same features are very popular for recreation, the goldenrod is subject to intensive disturbance. Management efforts to divert recreation to other areas of the gorge are needed. To help prevent the species' extinction, the Service proposed on April 24, 1987, to list it as Endangered (see BULLETIN Vol. XII No. 5). Information gained since then indicates that the species' status, though still vulnerable, is not as critical as once thought. Accordingly, the Service gave it the classification of Threatened in the April 7, 1988, final rule.

Saving the Masked Bobwhite

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The masked bobwhite (*Colinus virginianus ridgwayi*) is one of 21 subspecies of bobwhites in North America. It once ranged from southern Arizona to south-central Sonora, Mexico, but was extirpated from the United States by about 1900. Although some ornithologists believed it to be extinct during the 1950's and early 1960's, the masked bobwhite survived in small, isolated populations in Sonora.

The masked bobwhite tolerates only light grazing pressure on its arid grassland habitat, and its decline is directly attributable to the rapid expansion of the cattle industry in Arizona from 1870 to 1890. In many areas, little vegetation remained after grazing, particularly during the drought-stricken years of 1891-1893. With its habitat severely reduced, the masked bobwhite retreated. Livestock grazing persists today as a threat to the survival of masked bobwhites in Mexico.

A recovery program for the masked bobwhite began in 1966 when the Patuxent Wildlife Research Center in Laurel, Maryland, established a captive breeding colony and began developing the ability to produce large quantities of healthy birds for release into the wild. Biologists at Patuxent's Arizona Field Station conducted studies of the bird's habitat requirements and distribution, and developed release techniques, from 1967 to 1978. In 1985, the Buenos Aires National Wildlife Refuge in southeastern Arizona was established to restore and preserve habitat for the masked bobwhite. Captive-produced birds have been released at the refuge annually since then.

Captive Propagation

The captive breeding program at Patuxent started with the acquisition of four captive-bred pairs from private breeders. These birds had low fertility and hatch rates, along with high chick mortality, presumably because they were from inbred stock that was several generations removed from the wild. To improve the genetic quality of the captive flock, 57 additional wild birds were caught in Mexico and shipped to Patuxent in 1968 and 1970. Successful reproduction soon followed, and approximately 3,000 chicks are now produced annually.

The captive management program for masked bobwhites combines basic game-bird husbandry with research findings. Early research was conducted with



release of a Texas bobwhite male foster parent with a covey of 4-week-old masked bobwhite chicks

masked bobwhites and non-endangered northern bobwhite (*C. v. virginianus*) surrogates. Findings on nutritional requirements of the quail led to the development of optimal diets. Automatic light timers are used to simulate natural daylength and thereby stimulate egg production at appropriate times of the year. Medications are incorporated into the feed to prevent bacterial and parasitic infections. One of the most important aspects of the captive propagation program, however, is genetic management.

Because the masked bobwhite has a relatively short lifespan and generation interval, and because the captive population is derived from relatively few birds, the genetic integrity of the captive flock must be strictly maintained to prevent the loss of genetic diversity over time. To accomplish this, a computer-assisted pedigree and mate-selection program was established in 1982. Using this program, inbreeding is minimized and representation of the original founding animals is carried through from one generation to the next. This system has restricted inbreeding per generation to well below the one-percent level recommended by many

population geneticists. In addition, biochemical analyses have demonstrated that the captive population of masked bobwhites has retained a level of genetic diversity comparable to that of other bobwhite subspecies. Reproductive characteristics (fertility, hatch rates, and chick mortality) also show no apparent effects of inbreeding.

In 1986, to further improve the genetic quality of the captive flock, 18 additional masked bobwhites were caught in Mexico and brought to Patuxent. This was the first influx of "new blood" since 1970. Most of these birds produced young that same year, thus adding additional founder animals and greater genetic diversity among the captive birds.

Reintroductions in Arizona

From 1937 to 1950, numerous attempts were made to establish masked bobwhites in Arizona and New Mexico by releasing either pen-reared birds or wild bobwhites captured in Mexico. Unfortunately, most of these releases were made outside of the masked bobwhite's historical range, and none resulted in establishment of a viable wild population.

Searches for suitable release sites within the masked bobwhite's historical range, including Arizona's Altar Valley, began in 1969. Experimental releases made by the Fish and Wildlife Service from 1975 to 1979 led to the reestablishment of a sizeable population on the then privately owned Buenos Aires Ranch. In 1977, natural reproduction of reintroduced masked bobwhites was confirmed at this location. At its peak in 1979, this population included at least 74 calling males. However, two dry summers, coupled with commercial cattle grazing, subsequently caused a drastic population reduction. cursory investigations in 1982 and 1983 confirmed that only a few birds remained. In 1985, additional summer surveys failed to reveal evidence of masked bobwhites on the Buenos Aires Ranch.

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An adult masked bobwhite male in the wild exhibiting the solid breast coloration and nearly all black head present in this subspecies.



photo by Steven J. Dobrott

masked bobwhite release box at Buenos Aires National Wildlife Refuge at a site that now has excellent habitat

Masked Bobwhite

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In August 1985, the Service purchased the Buenos Aires Ranch for inclusion in the National Wildlife Refuge System. Three months later, a wild adult male masked bobwhite was seen at the refuge headquarters, indicating that some birds had indeed survived.

Biologists at the Buenos Aires Refuge are once again reintroducing the masked bobwhite into its former habitat using a release technique developed by the Arizona Field Station in 1977. The method includes the use of sterilized wild-caught males of a non-endangered subspecies, the Texas bobwhite (*C. v. texanus*), as foster parents for captive-bred masked bobwhite chicks. After a brief adoption

and conditioning period, these family units are released in areas believed to be good habitat for masked bobwhites. From 1985 to 1987, over 4,500 quail were released on the new refuge using this method. Tentative plans call for 5 consecutive years of releases, followed by a 2-year evaluation to determine if release procedures or habitat management practices should be modified and if additional releases are needed.

Breeding by released birds on the refuge has been documented. Although the summer rainfall that stimulates the quail to breed has been scant, one nest, two broods of hatchlings, and a subadult bird hatched in the wild have been observed. Several coveys are being monitored by radio-telemetry. Because little is known about the habitat requirements of the masked bobwhite, studying these birds will help direct future habitat management.

Today, the lush grasslands of the Altar Valley hold a brighter future for this Endangered quail, but the success of the release effort still depends on habitat recovery, weather cycles, and the ability of the released birds to survive and reproduce. The Service's goal is to establish a self-sustaining masked bobwhite population on the refuge within 10 years. If the reintroductions are successful, a unique wildlife component that has been missing from the Southwest for 80 years will be restored to its native habitat in Arizona.

APPROVED RECOVERY PLANS

Caria W. Corin

Division of Endangered Species and Habitat Conservation
Washington, D.C.

Black Lace Cactus Recovery Plan

The recovery plan for the black lace cactus (*Echinocereus reichenbachii* var. *albertii*) was approved on March 18, 1987. The plant was federally listed as Endangered on October 26, 1979, and is also listed by Texas under State law as Endangered. One of the five other varieties of *E. reichenbachii* is proposed for listing as Threatened (*E. r.* var. *chisoensis*; see BULLETIN Vol. XII No. 8), and another is under review for a possible listing proposal. Six other species in this genus are already listed as Endangered.

The black lace cactus is a particularly attractive plant, usually with a very dark purple central spine 0.08 to 0.11 inches (2 to 3 millimeters) long surrounded by 14 to 16 radial spines, white with dark purple tips, on each areole. Its pink to light purple flowers are 2 to 3 inches (5 to 7.5 centimeters) in diameter. The resulting green fruits have conspicuous long wool on the areoles. This variety grows either as solitary stems or in clumps of 5 to 12. Stems are green, 2.9 to 5.9 inches (7.4 to 15 cm)

tall and 1 to 2 inches (2.5 to 5 cm) in diameter. Some morphological variation is found among the three known populations of black lace cactus, one having plants somewhat larger with well-developed central spines, which are sometimes absent on some plants in the other populations.

Echinocereus reichenbachii, the lace cactus, ranges from western Kansas to northern Mexico. Its large colorful flowers make it popular among cactus fanciers, and it is widely collected. The black lace cactus, *E. r.* var. *albertii*, has been found only in three Texas Gulf Coast counties (Refugio, Jim Wells, and Kleberg), where it grows in sandy-loam brush tracts. Other varieties of the species are usually found among rocks in limestone areas.

The greatest threat to the survival of the black lace cactus is habitat destruction. Many sites formerly home to this plant have been cleared and replanted to pasture or cropland. Grazing presents a danger, as the plants grow in openings among the brushy areas and are thus susceptible to trampling by cattle. Collecting is another threat to this and many other cacti. This plant has been especially

popular because of its large, showy flowers. There has been some collecting of the black lace cactus, but apparently collectors have closely guarded their knowledge of its locations, and there is currently no evidence of collecting pressure.

All three known populations of the black lace cactus are on private land. The Endangered Species Act does not prohibit take on private land, although it does regulate interstate trade in Endangered plants. One of the Jim Wells County populations has been nearly destroyed by clearing. Another group found in that area is quite vigorous and thus far has escaped damage, although some clearing has occurred nearby and the landowner's plans are unknown. In Kleberg County, the earliest known collection was made on a high bank above a creek. This population was later destroyed by brush clearing, as was a second population found later. A surviving population (4 stands) was found in a broad band of brush along both sides of the creek, mostly in small openings among the brush. This also has

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Recovery Plans

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been probably saved from clearing by being on sloped drainage areas along a creek bed. In Refugio County, there is a large, patchy population over about 42 acres (17 hectares) adjacent to the Aransas River. During 1986 field surveys, individuals here appeared less robust than at other sites. There were fewer juveniles and some dead plants. Again, this is private land, leased for cattle grazing and petroleum activities.

The objectives of the Black Lace Cactus Recovery Plan include obtaining permanent protection of two or more of the known populations in order to consider reclassification to Threatened status. Full recovery criteria are to be established after the success of management at protected locations can be evaluated and searches for more populations are carried out. An important step has already been taken towards protection of the cactus. Landowners have been identified and are being contacted by The Texas Nature Conservancy. These people are given information about the black lace cactus

and are being encouraged to protect plants on their property. One family has already joined The Nature Conservancy's Land Steward Society, thus indicating a voluntary willingness to protect their black lace cacti. It is hoped that other landowners will follow suit and will consider steps leading to permanent land protection by the Service, The Nature Conservancy, or other conservation agencies.

Research needs to be conducted on various aspects of the black lace cactus' life history. Various attempts to transplant it have not met with long term success. Population dynamics, pollinators, and the restricting soil, climate, and microhabitat requirements must be studied. Searches will be conducted for undiscovered populations, and potential safe habitat for establishment of new populations needs to be found once more specific life requirements are known. Several agencies have land within the range of the black lace cactus where it may be possible to introduce the plant. Also, propagation studies are under way, and if they are successful, a botanical garden population will be established for use in research and public education.

Another important part of the recovery

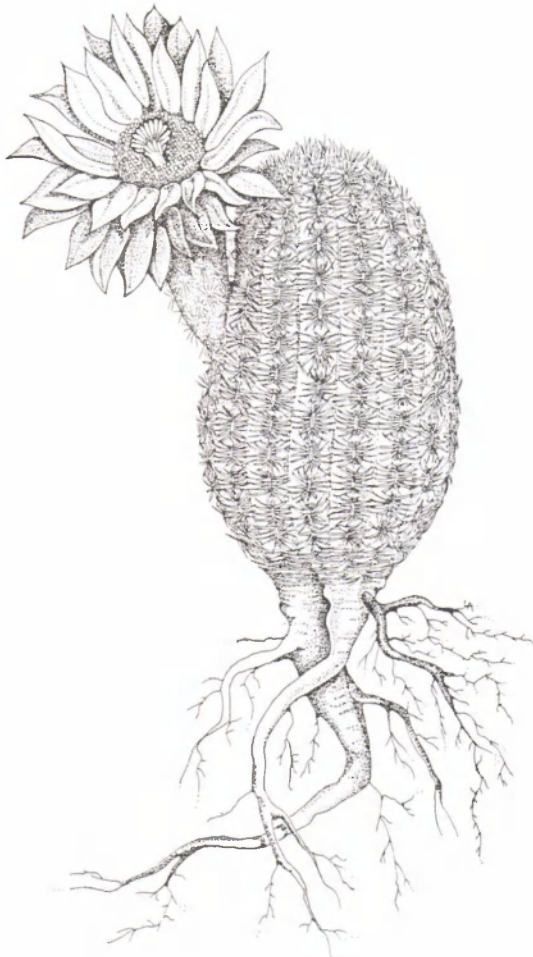
plan is to curtail any collecting activity that might be discovered. People need to be reminded of trade restrictions pertaining to Endangered species, and any convictions should be publicized as a deterrent. A comprehensive trade management plan for all cacti should be developed to reduce collecting pressure, and thus improve chances of recovery for all Threatened and Endangered cacti.

Atlantic Coast Piping Plover Recovery Plan

The piping plover (*Charadrius melodus*) is a small Nearctic shorebird found only in three geographical regions. It nests on sandy beaches along the Atlantic coast from Newfoundland to South Carolina; on sandy beaches in the Great Lakes area (now only at a few sites on the upper lakes); and along major river systems, alkali lakes, and wetlands in the northern Great Plains. On January 10, 1986, the Great Lakes population was designated as Endangered and the other two as Threatened. Two recovery regions have been designated, one for the Atlantic Coast population and the other for the inland areas. The Atlantic Coast Piping Plover Recovery Plan was approved by the Fish and Wildlife Service on March 31, 1988. (The plan for the inland recovery areas was approved May 12, 1988, and will be summarized in a future edition of the BULLETIN.)

The piping plover is about 7 inches (17 centimeters) long, with a 15-inch (38-cm) wingspan. In breeding plumage, it has a light beige back and crown, white rump and underparts, and black upper tail with white edging. The spread wings have a single white stripe, and black wrist marks and trailing edges. The single black breastband and black bar across the forehead are absent from the winter plumage. Breeding birds have orange legs and a bill with a black tip; the legs fade to yellow and the bill becomes mostly black in winter. Although two subspecies (Atlantic, *C. m. melodus*, and Northern Great Plains, *C. m. circumcinctus*) were officially recognized by the American Ornithologists' Union, recent electrophoretic and other studies have not detected any differences across the bird's range.

The Atlantic Coast population nests on coastal beaches, sand spits, barrier islands, and dunes. Piping plovers have also been found nesting on dredge spoil sites of suitable material. The nest is a shallow depression or scrape, often lined with pebbles or bits of shell. Nests are seldom closer than 100 feet (30 meters) apart; the usual interval is over 200 feet (60 m). Incubation of the normally 4 eggs takes 27 to 30 days, and is shared equally by the parents. The well-camou-



drawing by Linda A. Hling

black lace cactus (*Echinocereus reichenbachii* var. *aiberti*)

(continued on next page)



Piping plovers use a variety of methods to distract intruders from the nest site, including this "broken wing" display.

flaged chicks are precocial, leaving the nest as soon as their down is dry. Families remain together until the chicks fledge in 28 to 35 days. At that time, the birds leave the nesting territories for more communal feeding areas. Reported fledging success rates vary depending on how data are reported, but it appears that productivity in recent years has been below that needed to maintain the current population. Little is known about the winter distribution and ecology of the piping plover. It is believed, based on band recoveries and sightings, that the majority of birds that nest on the Atlantic Coast winter between North Carolina and Key West.

Piping plovers suffered, as did many other shorebirds, from shooting for the millinery trade around the turn of the century. With the passage of the Migratory Bird Treaty Act in 1918 they made a recovery, only to be impacted by habitat loss from dune stabilization and beach-front construction. Some recovery of populations occurred after the major hurricanes of 1938 and 1954, which flattened dunes and destroyed construction, rejuvenating nesting habitat. Since at least 1955 there has been a steady de-

crease. The 1986 breeding census found 550 pairs in the United States from Maine to North Carolina, and 240 pairs in eastern Canada. Over 80 percent of the known breeding is in Massachusetts, New York, New Jersey, and Virginia.

Major factors in the decline of the piping plover include habitat loss, human disturbance, and predation. Studies have found that nesting success is lower on recreational beaches than on undisturbed ones in the same area. Crushing of eggs and young by pedestrian and vehicular traffic and predation by cats and dogs are factors. Biologists suspect that subtle disturbances may cause disruption of territory establishment, leading to nest site abandonment. Disturbance also can result in increased chick mortality due to frequent interruption of their feeding activity. Debris and garbage left by humans may attract predators such as red foxes, dogs, cats, raccoons, opossums, striped skunks, and rats. Predation by opossums has increased as they have spread northward. Avian predators, including the northern raven, black-crowned night heron, fish crow, American crow, and certain gulls, are also a threat. Herring and great black-

backed gulls have both expanded their breeding range southward in recent years, resulting both in increased predation and in displacement of plovers from historical nesting areas.

The primary objective of the recovery plan is to increase the Atlantic Coast population to 1,200 self-sustaining breeding pairs, while maintaining the current distribution for 5 consecutive years. This population could then be considered for delisting. Conservation efforts to date have involved many Federal, State, and local groups. Censusing and research studies have been ongoing for many years. Fencing and posting to divert recreational users, while generally used to protect tern nesting areas, have also been somewhat beneficial for piping plovers. There is a continuing need to direct more of this effort towards the plovers, since their nesting precedes that of terns by 4 to 6 weeks. There has been complete closure of some beach portions on National Wildlife Refuges in Massachusetts, Rhode Island, Connecticut, New Jersey, and Virginia.

The highest priority tasks in the recovery
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Virginia Co-op Unit Assists Virginia and North Carolina with Spiny Mussel Recovery

Richard Neves
Leader, Virginia Cooperative Fish and
Wildlife Research Unit

Only three species of freshwater mussels in the world bear processes (spines) on their valves, and each is endemic to a river system in the Southern Atlantic Slope of the eastern United States. Although considerable disagreement exists on the proper binomials and taxonomic relationships among these species, their scientific and common names, according to the American Malacological Union, are the Altamaha spiny mussel (*Elliptio spinosa*), Altamaha River, Georgia; Tar River spiny mussel (*Elliptio steinstansana*), Tar River, North Carolina; and James River spiny mussel (*Pleurobema collina*), James River, Virginia. The Tar River spiny mussel was Federally listed as Endangered in July 1985, and the James River spiny mussel was proposed for

Endangered status in September 1987. The status of both species was reviewed in previous issues of the BULLETIN (Vol. X No. 7 and Vol. XII No. 10, respectively).

Because the biology of all three species is essentially unknown, and the Tar River species is critically endangered, the North Carolina Wildlife Resources Commission initiated a study with funds granted by the Fish and Wildlife Service under Section 6 of the Endangered Species Act to search for remnant populations in the Tar River and to conduct a life history study. Until enough specimens are located to initiate the proposed biological research, the Commission has contracted with the Virginia Cooperative Fish and Wildlife Research Unit to conduct a life history study on the related James River spiny mussel, which still occurs in sufficient enough numbers to be sampled and studied. Objectives of this research project are to describe the reproductive cycle (period of

spawning, gravidity, release of glochidia) and to determine the fish hosts needed by the glochidia to attach and metamorphose to free-living juvenile mussels.

Sampling for *P. collina* began in summer 1987 in the Craig Creek drainage, Craig County, Virginia. Subpopulations were located and will be monitored in 1988 for reproductive traits. The second objective of the study will combine sampling of fishes in streams to identify likely hosts and the collection of gravid female mussels to obtain glochidia for infesting suspected hosts in the laboratory. This work will begin in spring 1988 and continue through summer 1989. If or when sufficient specimens of the Tar River spiny mussel are located, research results on the James River species should expedite the planned life history investigation. Information on the reproductive cycles of these species will be critical elements in any efforts to implement recovery actions.

Recovery Plans

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every plan, those necessary to maintain current population status, are:

1. **Monitor population trends** through annual surveys in each State and province. This will assist in assessing the effectiveness of various management strategies and identify sites requiring more effort or different techniques. Existing survey methods are constantly being refined.

2. **Establish management programs** to improve productivity. These programs will identify landowners on whose property piping plovers nest, and provide them with protection and management recommendations.

3. **Reduce disturbance by pedestrians and off-road vehicles.** This task may involve fencing and posting of nest-

ing areas; using permits, closures, or other restrictions to limit recreational use and access; enforcing pet restrictions; and rerouting off-road vehicle traffic.

4. **Development and employment of predator control techniques,** including investigation of the long-term impacts of predation and other disturbance on the plovers. Some indirect predator control may be accomplished by removing litter and garbage, which attract predators to beaches. More direct methods of predator removal will be studied. Limited trials of predator exclosures placed around plover nests in 1987 produced encouraging results. Testing of this technique will be expanded in 1988.

5. **Gain a better understanding of piping plover wintering ecology.** Additional surveys to determine migration and wintering areas will assist in documenting that part of the plover's life cycle and

determine vital habitat characteristics, particularly on the wintering grounds. This habitat could then be protected.

6. **Develop public information.** The piping plover recovery effort has already benefitted from national news stories and magazine articles that have made more people aware of the bird's plight. Informational brochures, posters, slide/tape presentations, and other tools geared to various categories of beach users also are needed to educate the public and gain more support for the recovery effort.

Other actions needed to provide for full recovery of the Atlantic Coast population of the piping plover include creation of additional habitat by controlling vegetation encroachment, discouraging dune stabilization activities and construction in nesting areas, and encouraging well-timed use of dredge spoil to enhance or create additional nesting habitat.

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southwest of Tucson, Arizona, in late March. In the wild, the species is known from only one locality consisting of eight individuals. The species' native population, located on the Tohono O'odham Indian Reservation, dropped from 25 plants in 1982 to only 8 plants in 1988. The transplanted seedlings were propagated from seed at the Arizona-Sonora Desert Museum and are being carefully monitored. As of May 1, 61 of the 76 transplanted individuals were flourishing in their new habitat. Fifteen of the seedlings died from what appears to have been fertilizer burn. Another lot of 76 seedlings will be transplanted in late

October. The Service hopes to establish a second population of this species to ensure its survival in case the remaining eight wild plants fail.

Peebles Navajo cactus (*Pediocactus peeblesianus* var. *peeblesianus*) is a narrowly endemic plant restricted to specialized soils in central Arizona. Jeanette Milne, Transition Zone Horticultural Institute, and Dr. Barbara Phillips and Dr. Art Phillips, Museum of Northern Arizona, Flagstaff, under contract with the Service, have conducted trace element and mycorrhizal analyses on the soils at two Peebles Navajo cactus sites. (Some seed plants develop symbiotic relationships with soil fungi so that root structures composed of both fungal and seed plant tis-

sues are formed; these are known as mycorrhizae.)

The most striking microelement values were low levels of manganese, iron, and zinc. These low levels might prevent some potential plant competitors from establishing themselves in *Pediocactus* habitat. Low phosphorus levels, also characteristic of the sites, are probably important for the growth of the endomycorrhizae (in which fungal tissue actually grows within the roots of the higher plant) that characterize the roots of *P. peeblesianus*. It is typical to find mycorrhizae in very rocky, droughty soil conditions in which non-mycorrhizal plants have difficulty surviving. Mycorrhizae could provide a competitive edge for the cactus in these soils

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Regional News

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by greatly facilitating the absorption of the available water and nutrients by the cactus. Other plants might more easily compete with the cacti in other areas because of more favorable moisture conditions.

The Kemp's ridley sea turtle (*Lepidochelys kempii*) nesting season started late at Rancho Nuevo, Mexico, again this year, probably due to cool spring temperatures. The first turtle did not nest until April 21 and an additional 24 turtles nested the next day. Richard Byles, project officer for the ridley project, placed satellite transmitters on the first two turtles encountered and he has been collecting data on dive durations, surface durations, water temperatures, and locations from the turtles since the transmitters were deployed. Plans call for an additional 16 transmitters to be attached to adult ridleys by June of this year as part of a year-long movement and behavior study. An additional study was initiated this year with Kemp's ridleys in order to address tag loss with the Monel flipper tags currently in use. A new tag, the Passive Integrated Transponder (PIT) tag, is being implanted in the muscle of the left foreflipper of each turtle also tagged with a Monel tag. The PIT tags are the size of a grain of rice and are imbedded in a glass capsule. When interrogated by a hand-held reader, they emit a unique 10-digit ID code. The expected life of a PIT tag is 25 years or more.

Region 4 - A cooperative project to mark cavity trees of the Endangered red-cockaded woodpecker (*Picoides borealis*) on private lands continues to benefit the species. Initiated last year, the project is being conducted in the towns of Pinehurst and Southern Pines, North Carolina. These communities contain the largest known red-cockaded woodpecker population on private lands, estimated at about 130 birds. Approximately 600 cavity trees have been marked with 5x5-inch aluminum signs portraying the species and stating that the trees should not be cut. Each sign includes instructions to contact the North Carolina Wildlife Resources Commission or the local building inspector for information. Town planners in Pinehurst and Southern Pines have conditioned permits to prevent the destruction of marked trees. Contacts with landowners have provided a significant public relations benefit. Only one landowner did not want the trees on his property marked, and he was already aware of the trees and did not indicate any adverse feeling toward the species. As a result of this project's success, the Service hopes to secure funding to prepare generic signs that could be used on cavity trees through the Southeast. Cooperators in the North

Carolina project include the Service's Asheville, North Carolina, Field Office, the North Carolina Wildlife Resources Commission, North Carolina State University, and the town planners of Pinehurst and Southern Pines.

The Asheville Field Office and the U.S. Forest Service are continuing to monitor the Bachman's warbler (*Vermivora bachmanii*) population in Francis Marion National Forest, South Carolina. This area is one of the last documented nesting sites for the species, which has a 150-year history of disappearing from its known habitat for years at a time. The monitoring, which was agreed upon by the two agencies as part of an earlier formal consultation on the species, involves the experimental cutting and regeneration of a variety of different stands within the swamp forest. It is hoped that these habitat alterations will provide suitable nesting conditions for this bird, which was last sighted in 1980 in Cuba. The bird is now considered by many to be the rarest warbler in North America.

An overlook and trail facility on the Blue Ridge Parkway in North Carolina has been designed to avoid a recently located population of Heller's blazing star (*Liatris helleri*). Park resource management staff and landscape architects cooperated with the Fish and Wildlife Service and the National Park Service to complete the project. Also, permanent monitoring plots were established to measure the effects of trampling and increased visitor use on this species. New trails and visitor facilities have just been constructed as a result of the completion of the last section of the Parkway near Grandfather Mountain.

Region 6 - Both the Service and the Wyoming Department of Fish and Game are looking optimistically toward a strong comeback by the black-footed ferret (*Mustela nigripes*). Last year, the captive breeding program at Sybille, Wyoming, produced seven kits. The births brought to 25 the number of ferrets in captivity, but one died of cancer in January. Most of the 15 females have bred this spring, and up to 50 kits may be born in captivity in late May or early June. Dr. Tom Thorne, Wyoming Game and Fish Department, cannot provide guarantees, but there is great hope based on experience gained from last year's success.

Plans are under way to establish a second captive breeding population this summer. Wyoming and the Service advertised for different zoos to express an interest in providing facilities to house the second ferret population. It has been decided that establishing a second captive population would avoid having "all of our eggs in one basket" and would safeguard the species from extinction due to disease, fire, or some other unexpected catastrophe. Several proposals have been received in response to the advertisement, and a

decision on the site of the second captive breeding facility should be made soon.

With optimism for success of the captive breeding effort, the Service, in cooperation with other State and Federal agencies, is beginning to identify major prairie dog complexes that may be suitable for reintroduction sites. Through the Interstate Working Group, which currently represents 9 of the 14 States in the ferret's historic range, groups are mapping prairie dog complexes. Once they are mapped, they will be prioritized from a biological standpoint as to their suitability for ferrets. With good captive reproduction, establishment of a wild population could be attempted as early as 1991. Other reintroductions would follow in succeeding years. The Recovery Plan identifies the need for 10 widely distributed populations.

The final recovery plan for the North Park phacelia (*Phacelia formosula*) has been printed and distributed. There are nine known locations of this plant, which is only found in Jackson County, Colorado. Threats to its survival include off-road vehicle activity; livestock grazing, trampling, and trailing; and coal, oil, and gas development. The plan calls for protection of existing populations and research on the species' habitat and biology. Recovery plans can be purchased from the Fish and Wildlife Reference Service, 6011 Executive Boulevard, Rockville, Maryland 20852 (telephone toll-free at 800-582-3421).

A study of the Uncompahgre fritillary butterfly (*Boloria acrocnema*) was conducted in 1987, but a second year of studies must be conducted before the status of the species can be determined. The study will be jointly funded by the Fish and Wildlife Service, Forest Service, and Bureau of Land Management. After the results of the second year of study are known, these agencies will work together to develop conservation measures for the species. It is currently known to inhabit a small number of alpine meadows in Colorado.

Region 8 - The Florida Cooperative Fish and Wildlife Research Unit and the National Ecology Research Center are involved in an interagency study of the ecology of West Indian manatees (*Trichechus manatus*) in the Cumberland Sound region of Georgia. One purpose of this study is to determine the potential effects on manatees of dredging in the Sound. This information is needed to mitigate human-caused manatee deaths throughout the manatee's summer range. Through radio telemetry, manatees are studied during the spring and summer when they are present in the Cumberland Sound region. Time spent in the region by tagged manatees, areas of greatest use,

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and manatee behavior (particularly feeding behavior) are being noted.

In 1987, four radio-tagged manatees were studied in Cumberland Sound. Two had been tagged in March at Fernandina Beach in Nassau County, Florida, and two that were radio-tagged in Brevard County, Florida, migrated to Cumberland Sound in May. Tagged manatees were present in the region throughout the spring and summer at various times. Several areas were repeatedly used by tagged as well as untagged manatees. They were observed to feed at high tide on *Spartina* growing at the water's edge. As part of the study, another manatee was radio-tagged February 25 at Fernandina Beach.

Biologists from the Patuxent Wildlife Research Center's Hawaii Research Station assisted State personnel in a comprehensive nonbreeding-season population survey of the Endangered palila (*Loxioides bailleui*) on February 2-4, 1988. The evaluation was conducted on the wooded slopes of Mauna Kea, the last remaining habitat of this bird. A total of 219 palila were recorded at 65 of 150 stations censused on 10 transects. The population was estimated to be 4,350 birds (with a 95 percent confidence range of 3,199 to 5,517 birds). This latest estimate reflects a 26 percent increase over the July 1987 count. The increasing trend since 1985 is encouraging; however, the palila is still restricted to only a small portion of the apparently suitable habitat on Mauna Kea.

In February, Hawaii Research Station staff biologists completed an aviary study to quantify potential behavioral effects of radio telemetry transmitters on the palila. Results indicated that the behavior of palilas with "placebo" transmitters was not

different from that of control birds without transmitters. Following the aviary study, a full-scale radio telemetry study on free-ranging palilas began on February 22 to determine palila habitat selection and use, daily movement patterns, and home

range. Ten adult palilas (five males, three females, two of unknown sex) have since been mist-netted, weighed, measured, banded, and fitted with operational radio transmitters weighing approximately 1.3 grams.

BOX SCORE OF U.S. LISTINGS AND RECOVERY PLANS

Category	ENDANGERED			THREATENED			SPECIES* TOTAL	SPECIES WITH PLANS
	U.S. Only	U.S. & Foreign	Foreign Only	U.S. Only	U.S. & Foreign	Foreign Only		
Mammals	28	19	240	3	3	23	316	25
Birds	61	15	145	7	3	0	231	59
Reptiles	8	7	59	14	4	14	106	22
Amphibians	5	0	8	4	0	0	17	5
Fishes	41	2	11	25	6	0	85	45
Snails	3	0	1	5	0	0	9	7
Clams	29	0	2	0	0	0	31	22
Crustaceans	5	0	0	1	0	0	6	21
Insects	8	0	0	7	0	0	15	12
Plants	140	6	1	33	3	2	185	70
TOTAL	328	49	467	99	19	39	1001	269 **

Total U.S. Endangered 377

Total U.S. Threatened 118

Total U.S. Listed 495

Recovery Plans approved: 229

Species currently proposed for listing: 22 animals
26 plants

* Separate populations of a species that are listed both as Endangered and Threatened are tallied twice. Those species are: the leopard, gray wolf, grizzly bear, bald eagle, piping plover, roseate tern, Nile crocodile, green sea turtle, and olive Ridley sea turtle. For the purposes of the Endangered Species Act, the term "species" can mean a species, subspecies, or distinct vertebrate population. Several entries also represent entire genera or even families.

** More than one species are covered by some recovery plans, and a few species have separate plans covering different parts of their ranges.

Number of Cooperative Agreements signed with States and Territories: 51 fish & wildlife
April 30, 1988 36 plants

May 1988

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ENDANGERED SPECIES

Technical Bulletin

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